Meniscal Tissue Repair Using Radiofrequency

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Where did the idea originate to treat meniscal injuries with radiofrequency (RF)?

In the study published by Shosheim and Caspari on meniscectomy in rabbits with radiofrequency electrodes, the authors saw a hypercellularity reaction in the zone exposed to the electrode and a complete recovery after 3 months. Further studies of RF and meniscectomy done by Miller et al and Bert et al proved that human meniscal tissue recovers fully after exposition to RF thermal energy after meniscectomy and that it also is safe.

How does RF differ from other meniscal repair techniques?

The traditional techniques are based on stimulating the tissue by causing controlled damage, either with a shaver motor blade, or rasp, or by promoting the healing from the factors contained in a blood clot. Ochi et al reported on cytokines expressed by meniscal tissue under mechanical damage such as shaving or rasping. Our technique stimulates by modulating the cells with the electrothermal effect of the radiofrequency instead. This would be called “rebooting the meniscal tissue.”

What purpose does healing biostimulation serve in the treatment of meniscal injuries?

It enhances the response of the synovial tissue. Radiofrequency in meniscal tissue acts as a homing device for synoviocytes, signaling a call for help. The synoviocyte plays a crucial role in the active repair process. When we first started, we applied 45 watts, but now with the learning curve we apply 20 watts at a controlled temperature of 45°C. This creates a “tide wave effect,” which causes erythema of the meniscal avascular zone that eventually will disappear in 3 months.

Has healing biostimulation been shown to be effective in the treatment of other orthopedic injuries?

Tasto et al published a study on tendinopathies and there are some unpublished studies on the shoulder with labrum detachment.
Can the combination of an all-inside suturing technique with high-frequency biostimulation be considered superior to other meniscal repair techniques?

It is not in the least inferior, and it has some advantages. When RF is applied to loose meniscal tissue, you cannot rasp or use the shaver because it may remove valuable tissue. With RF, it is possible to stabilize and biostimulate the tissue simultaneously. Once the unstable tissue becomes stable, it can then act as a scaffold. During meniscal repair, the sutures alone are not sufficient. The meniscal tissue needs biological support, which is provided by RF.

Does the addition of healing biostimulation to the all-inside suturing technique increase operative time?

No. The same amount of time spent rasping, shaving—which is too bulky to reach certain key places—is the same amount of time it takes to apply RF.

What has been your success rate?

Twelve years ago, the results from our first cases were published and the second views were encouraging. Two years later we conducted a multicenter study of 19 patients with 88% demonstrating healed injuries on second views of complex meniscal injuries that were otherwise resectable. It is now a regular part of my arsenal to treat any reparable meniscal injury either with or without sutures. Higuchi et al have also applied RF on meniscal repair in humans with good outcome.

REFERENCES